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Strategies to develop maintenance engineers for multiple dwellings in Korea—Focusing on the US and Japanese qualification systems

Sang-Ho Lee [a], Sanghoon Park [b,*], Cheonghoon Baek [c]

[a] School of Civil & Environmental Engineering, Yonsei University, 50 Yonsei-Ro, Seodaemun-Gu, Seoul 120-749, Republic of Korea
[b] Bk21 Research Team, Yonsei University, 50 Yonsei-Ro, Seodaemun-Gu, Seoul 120-749, Republic of Korea
[c] Korea Institute of Construction Technology, 2311, Daewha-dong, Ilsan-gu, Goyang-si, Gyeonggi-do, Republic of Korea

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ABSTRACT

Korea has focused on growth-oriented policies by creating new housing units rather than maintaining or rehabilitating existing ones although having a housing stock as huge as those of other advanced nations. There have been, thus, few efforts to develop professional human resources who maintain and preserve the existing housing. Now, it has been a considerable time since two million housing units were built in the new towns around Seoul such as Bundang and Ilsan. It is expected that maintenance engineers for multiple dwellings will be of much importance in Korea.

The purpose of this study is to present ways to develop maintenance engineers for multiple dwellings in Korea by analyzing the US and Japanese qualification systems for maintenance engineers for multi-family dwellings.

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* Corresponding author. Tel.: +82 2 2123 4298; fax: +82 2 6455 4298.
E-mail address: okpshppp@hanmail.net (S. Park).

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1. Introduction and objective of research

Current trends of metropolitan cities such as high density of population, rising land prices, and aging society have led to a sharp increase in high-rise buildings and slum areas. Worldwide efforts to save energy and to conduct green policies have encouraged maintenance of existing housing rather than new construction. Those who had been interested in a paradigm of housing production are giving much attention to how to safely utilize the existing housing stock while maintaining the quality of housing.

Korea, despite having a housing stock as huge as those of other developed countries, has striven to conduct growth-oriented policies by constructing housing units rather than rehabilitating or maintaining existing ones. There have been, thus, a few efforts to develop engineers who maintain the existing multiple dwellings [1].

It has been a considerable time since the construction of condominiums in Seoul and those in the first new towns including Bundang and Ilsan. Now it is expected to be imperative to foster engineers who maintain the existing multiple dwellings (in the sectors of community association management, counseling, directions, property management, repair, maintenance, etc.) so that the existing housing can be maintained at a proper quality level and be used with safety.

The United States not only has an enormous housing stock but also has run a lot of qualification systems to maintain various types of multiple dwellings where people of different races and with different preferences live together. Since a number of houses are old as 40–60 years, the country has practical know-how and techniques that Korea does not have to cope with problems arising from maintenance of multiple dwellings.

Formulating the Basic Law for Housing Life in 2006, Japan has changed the keynote of national housing policies from new construction to maintenance of existing housing so as to respond actively to environmental changes [2]. It also has operated a number of systems for maintenance qualification in order to maintain its huge housing stock and safely preserve a variety of housing types. With green policies and housing maintenance receiving great attention, this study aims to present ways to develop maintenance engineers for multiple dwellings in Korea by analyzing the US and Japanese qualifications for professionals to maintain multi-family dwellings.

2. Objects and methods of research

2.1. Research object & method

This paper has investigated maintenance professionals for multiple dwellings from Korea, US, and Japan. Because each of the abovementioned countries (Korea, US, Japan) have different maintenance engineer operating systems in every province or state, there are limitations in investigating every city. Therefore, the investigation was conducted focusing on the maintenance professional system operating in Seoul of Korea, New York of the US, and Tokyo of Japan.

In addition, the objects of this study are the Korean qualifications for housing managers for private condominiums, and the qualifications for maintenance professionals for private multiple dwellings certified by the US maintenance-related institutes, and the Japanese government and related institutes (See Table 1). Besides these qualifications, Korea, the US and Japan have the laws stipulating certain qualifications for electric and mechanical engineers and the like. But, such qualifications are excluded here because they are stated separately by each relevant law.

Research into the literature and interviews with professionals were conducted to collect and examine related information; and to obtain more detailed data and verify information, on-site surveys and interviews were carried out with relevant Korean, US and

Table 1
Institutes and qualifications researched.

Item	Relevant institute	Qualification	National/private qualification
Korea	Korea Land & Housing Corporation Korea Housing Managers' Association	Housing Manager	National
USA	Community Association Institute (CAI)	Certified Manager of Community Associations (CMCA) Professional Community Association Manager (PCAM) Large-Scale Manager (LSM) CIRMS (Community Insurance and Risk Management Specialist)	Private
	Institute of Real Estate Management (IREM)	Certified Property Manager (CPM) Accredited Residential Manager (ARM) Certified Apartment Management (CAM) Certified Apartment Maintenance Technician (CAMT)	
Japan	Mansion Management Center	Mansion Manager	National
	High-Rise Housing Management Business Association	Executive Manager	National
		Divided Ownership Manager	Private
		Mansion Maintenance and Repair Engineer	Private
	Building and Equipment Life Cycle Association (BELCA)	Construction Equipment Total Management Engineer	Private
		Construction Finishing Diagnosis Engineer	Private
		Construction Equipment Diagnosis Engineer	Private

Japanese institutes. Especially, the Korean institutes interviewed include government agencies (the Ministry of Land, Transport and Maritime Affairs, Seoul City), government-affiliated research centers (Korea Infrastructure Safety & Technology Corporation, Korea Institute of Construction Technology, Korea Land & Housing Corporation), and Korea Housing Managers' Association. The professionals of these institutes were interviewed in order to find problems in the Korean qualifications for maintenance engineers (Section 4) and to provide ways to develop maintenance engineers for multiple dwellings in Korea (Section 6).

2.2. Selection of countries subject to comparison

This paper selected countries (investigated representative cities since there is a limitation in investigating all materials of the country) that can appropriately benchmark Korea's system of maintenance professionals for multiple dwellings in Korea.

The major items for the criteria of selecting the countries subject to comparison include politically, economically, and socially stable cities, size of existing housing, higher income level than Seoul (or Korea), previous experience in maintenance, and Manhattanization; and analysis was conducted on the cities subject to comparison with these criteria.

For Asia, Shanghai of China and Tokyo of Japan were selected for the comparison regarding population (among hub cities), and the candidate cities included New York, LA, and Chicago of the US for North America (US), and London of the UK, Berlin of Germany, and Paris of France for Europe.

When viewing (Table 2), for the global ranking in the cities that has evaluated economic, political, and social stability of a city, New York and London were evaluated to be superior in this category. Furthermore, in Asia, Tokyo is ahead of Shanghai in population, GDP per capita, and the number of households. In the case of North America, New York is leading LA and Chicago in population, number of households, and Manhattanization ratio. In the case of Europe, London is ahead of Berlin and Paris in city scale and number of households.

Therefore, despite being able to designate New York of the US, Tokyo of Japan, and London of the UK as target cities, this study has selected the US (New York) and Japan (Tokyo) as the final countries subject to comparison in a sense to identify the maintenance professional system of the representative city of the West and the East.

3. Relation between energy and the development of the qualification of maintenance engineers for multiple dwellings

In this section, the reason the development of the qualification of maintenance engineer for multiple dwellings is needed from the aspect of energy saving was summed up into 3 points to explain the relation between energy and the development of the qualification of maintenance engineer for multiple dwellings.

First, there is the shift from the newly constructed society to the regenerative society due to rapid urbanization and industrialization.

Korea has been showing a tendency of focusing on new constructions up to the present due to its government-led housing supply policy. During the 1970s, the Housing Construction Promotion Act was enacted for large scale housing constructions to provide grounds for housing supply, and from the 1980s up to the 1990s, approximately 7 million houses were constructed to respond to the lack of housing due to the booming economy and urban concentration [3].

Entering the 2000s, the country has reached a point of having excessive number of housing as the housing supply ratio reached 110% [4]. Furthermore, approximately 80% of the overall multiple dwellings turned out to be housings built within the past 20 years [5], and it is anticipated to bring up significant problems in full-scale renovations. In addition to that, because the government is enacting the criteria which considers energy saving upon carrying out renovation of existing buildings, the development of the qualification for maintenance professionals could have a direct impact in energy saving.

Secondly, there is a need to develop manpower responding to the reutilization of existing housing and improvement of the quality of living.

The leading countries in the world are exerting every effort to improve habitability for the improvement of the quality of living as well as carrying out green policies such as energy saving policies. Under these circumstances, the government is seeking to switch over from the era of quantitative supply in the past to the era of reutilizing existing housing and improving the quality of living according to social changes such as the improvement of national income, low birthrate, and improved quality of living.

Even in Korea, with 2008 serving as the turning point, 'Low Carbon Green Growth' has been presented as a national vision, and the government started having interest in housings capable of sustainable development as it aimed to suppress reconstruction and redevelopment and improve the quality of living in the overall construction market [6].

As the capability to react to environmental and energy issues stood out, the Korean government recognized environmental issues as a new opportunity for sustainable growth rather than as a factor limiting economic growth, and have declared "Low Carbon Green Growth" as a new national growth paradigm and the government's critical task. It has declared that, through this, the government will regenerate housings and create green technology related jobs for 160,000 people [7].

Despite such social changes which include the reutilization of existing housing, improvement of the quality of living, and energy

Table 2
Comparison of the current status of the maintenance of global hub cities.

Classification		Asia			North America (US)			Europe		
City name (Country)		Shanghai (China)	Tokyo (Japan)	Seoul (Korea)	New York	LA	Chicago	London (UK)	Berlin (Germany)	Paris (France)
Global City Ranking	GPCI	25th	4th	13th	1st	9th	14th	2nd	6th	3rd
	WCCI	24th	3rd	9th	2nd	17th	5th	1st	23rd	7th
	GWC	9th	6th	12th	1st	42nd	30th	2nd	–	4th
Area (km^2)		6342	2102	605	1214	1290	606	1577	892	87
Population (person)/year		10002005	12902008	10292005	8212005	3852006	2892006	7362006	3422007	2172006
GDP per capita by country ($)		2001	34,188	18,391		39,732		35,616	33,345	32,918
No. of households (10,000)		500	543	331	326	331	106	319	189	130
Average lifespan of housing by country		–	30 years	17 years		66.4 years		–	70 years	36.7 years
Percentage of 5th floor or higher		–	31.7%	36.1%	49.9%	4%	13.4%	8.5%	–	–

saving, manpower has been fostered focusing on only new housing constructions.

In order to achieve and carry out the critical task of “Low Carbon Green Growth” which encompasses the utilization of existing housing, energy saving, and improvement of the quality of living, it must first be preceded by the development of manpower and the establishment of a qualification system.

The third point is to prevent wasting construction resources through reutilizing the stock of existing housing.

Korea's housing policies were centered around new constructions or reconstructions due to its economic revival and urban centralization. Due to the continuous rise of housing prices, the repeated vicious cycle of constructing new housings for economic reasons even though there were numerous housings without any performance problems became the major factor in wasting construction resources in Korea.

As mentioned above, in order to respond to housing policies which emphasizes existing housing and energy saving, there is a desperate need for fostering professionals related to these policies.

4. Environments of Korea, the US and Japan in which multiple dwellings are maintained

4.1. Housing stock and proportion of multiple dwellings

There has been a rapid increase in the Korea's housing stock [8]: the housing stock was about 16 million housing units in 2005, which is 1.7 times greater than in 1995 and 2.6 times greater than in 1985. The multiple dwellings account for a large share of the entire housing: the percentage of them in all of the housing units is 52.4%. The rate of vacancies also increased from 2.8% in 1995 to 4.6% in 2005.

The housing stock of the United States [9] was about 124 million units in 2005, which is nearly 7.8 times larger than that of Korea. The multiple dwellings represent a small proportion (5.6%) of the entire housing.

The housing stock of Japan [10] was about 53 million units in 2003, which is nearly 3.4 times greater than that of Korea. Like Korea, the multiple dwellings in Japan occupy a large share (about 40%) of the entire housing.

4.2. The proportion of high-rise multiple dwellings in Metropolis

The ratio of multiple dwellings five-stories or higher in all of the units in Seoul (2005) is 36.1%, and especially the ratio of dwellings 15-stories or higher is 23.6%, which means a number of multiple dwellings are in high-rise buildings.

In New York City (2005), multiple dwellings five-stories or higher represent a significant share (49.9%) of the entire housing while dwellings 20-stories or higher account for 6.9%.

The ratio of multiple dwellings five-stories or higher in the entire housing of Tokyo (2003) is 31.7% and the ratio of dwellings 15-stories or higher is 1.5%, which shows that a lot of multiple dwellings are in mid- or high-rise buildings.

4.3. Proportion of elderly householders among all householders in Metropolis

The ratio of elderly householders among all the householders in Seoul surged from 8.4% in 1985 to 16.9% in 2005, but the average birthrate was the lowest in the world at 1.15 per woman, which shows that population decline will be of grave concern in the future of Korea [8]. The ratio of the aged householders among all the householders in New York did not show any significant change: it was 20.5% in 1999 and 19% in 2005.

In Tokyo, the rate of the elderly householders among all the householders rose significantly from 17.9% in 1998 to 22.5% in 2003. The birthrate in Japan was also very low at 1.37 per woman.

4.4. Worn-out multiple dwellings

Table 3 shows the aggregate ratio of housing units according to their age from the year of construction completion. The ratio of the houses up to 10-year old out of the total housing in Korea is 45.1% and the aggregate ratio of those up to 20-year old is 79.5%, and the aggregate ratio of those up to 30-year old is 94.3%. That is, about 80% of all the multiple dwellings are up to 20-years old [11–13] (Many of the relevant studies state that the finishing materials (e. g. tiles) and facilities of a structure shall be repaired or replaced in a five- to 20-year cycle, and the main structural parts in a 20-year cycle or more). Housing maintenance is expected to be urgently required for these old houses.

In the United States, the ratio of dwellings up to 10-year old out of the entire housing is 8.2%, and the aggregate ratio of those up to 40-year old is 54.3% and the aggregate ratio of those up to 60-year old is 88.2%. Thus, it was found out that generally, dwellings are used for a long time.

The ratio of houses up to 13-year old out of the entire housing in Japan is 34.8%, and the aggregate ratio of those up to 20-year old is 60.6%, and the aggregate ratio of those up to 30-year old is 82.0%.

4.5. General opinion

Korea has a huge housing stock, and multiple dwellings account for a considerable share of the entire housing at 52.4%. In addition, it has been about 20 years since many of the multiple dwellings were built, so it is thought that maintenance on a large scale such as repair or replacement of outer walls, common facilities, electric equipment and pipelines will be required and accordingly, it will be

Table 3
The aggregate rates of houses according to age from construction completion. (Unit: 1000 families, %).

Class	Korea				The US				Japan			
	National	Aggregate rate	Seoul	Aggregate rate	National	Aggregate rate	New York	Aggregate rate	National	Aggregate rate	Tokyo	Aggregate rate
Up to 70-year	–	–	–	–	124,378	100.0	4849.7	100.0	–	–	–	–
Up to 60-year	–	–	–	–	109,701	88.2	4114.4	84.8	44,665	100.0	4816	100.0
Up to 50-year	12,495	1000	2242	1000	95,788	77.0	2981.1	61.5	42,477	95.1	4740	98.4
Up to 40-year	12,084	967	2224	992	67,593	54.3	1737.6	35.8	41,090	92.0	4601	95.5
Up to 30-year	11,782	943	2185	974	42,502	34.2	855.4	17.6	36,610	82.0	4086	84.8
Up to 20-year	9928	795	1817	811	25,182	21.0	519.4	10.7	27,069	60.6	3135	65.1
Up to 10-year (from construction)	5629	451	1018	454	10,138	8.2	217.4	4.5	15,549	34.8	1815	37.7

very important in Korea to develop professional human resources who maintain multiple dwellings to keep them sustainable.

The United States not only has an enormous housing stock but also has run a lot of qualification systems to maintain various types of multiple dwellings where people of different races and with different preferences live together. Since a number of houses are old as 40–60 years, the country has practical know-how and techniques that Korea does not have to cope with problems arising from maintenance of multiple dwellings.

Formulating the Basic Law for Housing Life in 2006, Japan has changed the keynote of national housing policies from new construction to maintenance of existing housing. With the main goal of improving living conditions, it has fostered long-life multiple dwellings, strict housing history system, promotion of housing reform and organization of financial systems in order to meet the demands for maintenance [2,14].

Therefore, it will be possible to propose ways to develop engineers of maintenance for multiple dwellings in Korea by referring to the qualification systems of the United States and Japan for maintenance specialists for multi-family dwellings.

5. Research and analysis on qualification systems for maintenance engineers of Korea, the US and Japan

This section analyzes the framework for developing maintenance engineers, that is, the qualification systems for maintenance engineers. The types and functions, requirements for qualification, examination and continuing education of the systems of Korea, the United States and Japan are comparatively analyzed in order to come up with the ways to develop maintenance engineers for multiple dwellings in Korea.

5.1. Korea

The qualifications of maintenance engineers for multiple dwellings in Korea are operated by public institutes and there are no qualifications for such engineers certified by private organizations. Korea Land & Housing Corporation is entrusted by the Ministry of Land, Transport and Maritime Affairs with operation of the national qualification for housing engineers.

Currently, multiple dwellings with more than 300 families or an apartment complex with more than 160 families, equipped with elevators or central heating systems are required to be managed by housing engineers according to the relevant laws [15].

A resident manager should have the qualification for a housing manager or deputy housing manager. Those who have at least three-year experience as a resident manager for multiple dwellings in need of compulsory maintenance or have at least five-year experience of related works are certified by the government as a housing manager [16]. The duties of a housing manager (deputy) are divided into administrative and technical works. The administrative works include accounting management, office management, personnel management, occupant management, advertisement, control of welfare facilities and resolution of conflict among residents, while the technical works involve environment management, control of buildings, safety management, equipment control, maintenance of facilities, hygiene and other works needed for everyday living.

Those who pass the examination run by the government are given the certificate of housing manager (deputy) regardless of their academic titles and specialty.

The housing mangers, after being certified, have to attend statutory education, but there is no redesignation or continuing education for them. The Housing Act stipulates that a deputy housing manager should attend an education program within a year from the assignment as a resident manager and within a year from the designation as a housing manager. According to Article 65 of the enforcement ordinance of the Act, a deputy housing manager who intends to conduct safety checks for multiple dwellings 16-stories or higher should be provided with education within three years from the designation as housing manager. The Special Law for Safety Management of Facilities states that a senior engineer who is allowed to do safety checks and precision safety diagnosis should attend an education course within three years of the designation as a senior engineer [17].

5.2. The United States

The laws and regulations of the United States do not have such provisions on compulsory assignment of managers for multiple dwellings. The qualifications of managers for multi-family dwellings are not operated publicly, but operated by the related private institutes such as Community Association Institute (CAI) and Institute of Real Estate Management (IREM) [18].

The community associations that manage multiple dwellings are operated by community associations themselves (volunteers or self-management), association-employed managers or management companies, and the professional human resources for management are screened through qualifications certified by private entities. The leading US institutes regarding maintenance of multiple dwellings are CAI and IREM [19,20].

5.2.1. Types and functions of qualifications

The US qualifications for professionals who maintain multiple dwellings are certified mainly by private institutes such as CAI and IREM. The qualifications by these institutes are divided up into those for operating and managing community associations, for controlling buildings and managing properties, and for technical functions like repair or improvement in a building.

CAI operates the designations of Certified Manager of Community Associations (CMCA), Association Management Specialist (AMS), Professional Community Association Manager (PCAM), Large-Scale Manager (LSM) and Community Insurance and Risk Management Specialist (CIRMS).

CMCA is the first step for obtaining basic knowledge required for community association management and is a prerequisite for AMS or PCAM. To obtain the CMCA certification, a person is tested in legal documents, roles and responsibilities, management ethics, effective assessment, how to maintain records, effective maintenance and so on.

AMS is the second course for career development after CMCA and is the certification for middle managers who are allowed for community association management and control. The PCAM designation is the highest professional recognition available to general managers who specialize in community association management. LSM is the certification for those who want to be a large-scale community manager (at least 1200-family dwellings, larger than 1000 acres). CIRMS is the qualification for those who are responsible for risk management of community associations, therefore, these specialists help the associations handle financial difficulties and safety accidents arising in multiple dwellings and are required to have expertise in laws, regulations and insurance.

IREM certifies the designations of Accredited Residential Manager (ARM) and Certified Property Manager (CPM).

ARM is the qualification for middle managers who manage primarily residential buildings and properties. To obtain the qualification, a person is tested in financial operations, human resources management, legal and risk management, maintenance and operations, and so on.

CPM is the top-level certification of IREM, thus, those with the certification are able to manage properties of all types including residential and common buildings.

5.2.2. Requirements for qualification application

Since CMCA certified by CAI is a prerequisite for the upper-level qualifications (AMS, PCAM), it does not require candidates to meet certain conditions. AMS is granted to those who maintain the CMCA certification and meet the requirements of continuous education. The PCAM designation targets the people who obtained the CMCA certification, maintain the AMS certification, comply with the CAI Professional Manager Code of Ethics, and meet the requirements of continuing education. LSM is for those who maintain PCAM certification, and have managed a large-sized housing complex or have at least 10-year experience of management or have at least five-year experience of large-sized community association management. The CIRMS certification is allowed to people who have at least five-year experience of insurance works for a community association or have adequate legal knowledge and ethicality in the related industry.

To apply for the CPM certification of IREM, a person should satisfy one of the three requirements: completion of IREM education courses, maintenance of other related qualification, or completion of the bachelor's or master's course in relevant fields. In case a person has completed specific IREM courses, maintained other required qualification or graduated from college or graduate school, the person is allowed to apply for ARM.

5.2.3. Redesignation and continuing education

Since the CAI's CMCA certification is a prerequisite for AMS or PCAM, no redesignation or continuing education is required. The AMS designee needs to be redesignated every three years and to provide proof of continuing education (at least 9 h of participation in certain courses of PMDP and in CAI seminar/conference).

The PCAM designation should be renewed every three years and requires an attainment of 45 credit points[3] within three years. The LSM designee needs to be redesignated every three years and to prove 75 credit points. The CIRMS designation should be renewed every three years and requires 35 credit points. As for the IREM's CPM and ARM certifications, the required courses and credit points for redesignation vary according to the state.

5.3. Japan

The qualifications of Japan for housing maintenance are divided into public and private certifications. The related institutes are entrusted by the government with designation of the certifications: the Mansion Manager certification (entrusted to Mansion Management Center) and the Executive Manager certification (entrusted to High-Rise Housing Management Business Association). The private designations are operated by related institutes according to characteristics of the institutes [21–23].

5.3.1. Types and functions of qualifications

The qualifications of Japan for housing maintenance can be divided into those certified by the Mansion Management Center, by the High-Rise Housing Management Business Association, and by the Building and Equipment Life Cycle Association (BELCA).

The institutes operate the qualifications for those who specialize in counseling and advisory services for community associations of mansions (In this study, a ‘mansion’ means multiple dwellings of a concrete structure, that is, common multiple dwellings), community association management, building operation and management, and diagnosis and repair of buildings and facilities, and the like.

Mansion Management Center grants the mansion manager certification. A certified mansion manager is qualified to provide advisory services, counseling and instructions for mansion community associations.

High-Rise Housing Management Business Association operates the national certification for executive managers and the private certifications for divided ownership managers and mansion maintenance and repair engineers. According to the Mansion Management Optimization Act (Article 61 of the Rule, Article 56 of the Act), a management firm entrusted with management should designate at least one executive manager for 30 community associations and report it to an administrative agency. A certified executive manager is responsible for explaining the significance of a management contract as a precondition for management works and for managing mansions by checking and reporting entrusted management duties [24].

A divided ownership manager provides comprehensive management on designing, planning and operation of buildings for divided ownership such as mansions.

A certified mansion maintenance and repair engineer is allowed through cooperation with a divided ownership manager or executive manager to check and diagnose mansions, plan to repair mansions, provide consulting, manage construction and review necessities for reconstruction.

BELCA operates the designations for construction equipment total management engineers, construction finishing diagnosis engineers and construction equipment diagnosis engineers.

A construction equipment total management engineer devises maintenance/preservation plans and long-term repair plans for mansions, and manages concerned engineers for maintenance and preservation.

The certification for construction finishing diagnosis engineers was created after a serious accident in Kitakyushu in 1989 in which tiles came off the outer wall of a high rise residential building, causing casualties. To enhance the safety of construction finishing, a certified construction finishing diagnosis engineer should conduct regular and informal checks for non-structures (e.g. tiles, windows) and repair checks for construction finishing materials.

A certified construction equipment diagnosis engineer is allowed to diagnose and repair construction equipment and therefore, checks construction equipment in physical degradation, solidity, economical efficiency and seismic safety.

5.3.2. Requirements for qualification application

The national qualifications of Japan (the mansion manager certification and the executive manager certification) do not require certain academic or career conditions.

To attain the divided ownership manager certification of High-Rise Housing Management Business Association, a person should have experience in building management and at least three-year experience in related fields or work for a mansion management company as a manager, supervisor or a higher position. Those who have a certain academic or career background, and recognized qualifications can apply for the mansion maintenance and repair engineer certification.

If a person has a certain qualification such as first-class certified architect and experience in related fields, or at least 11-year experience in related fields, and at least three-year experience in supervision, the person can apply for the BELCA certification for construction equipment total management engineers. Those who satisfy at least one of the three conditions (attainment of a related qualification, certain academic background and experience in related fields) can apply for the construction finishing diagnosis engineer and construction equipment diagnosis engineer certifications.

5.3.3. Redesignation and continuing education

The national certifications for mansion managers and executive managers require statutory education and redesignation every five years.

The High-Rise Housing Management Business Association certifications for divided ownership managers and for mansion maintenance and repair engineers need to be renewed every five years. The divided ownership managers should attend educational courses, but no examination is required. The mansion maintenance and repair engineers should attend courses or submit an article for redesignation.

The BELCA certifications for construction equipment total management engineers, construction finishing diagnosis engineers and construction equipment diagnosis engineers need to be renewed every five years. For redesignation, construction finishing diagnosis engineers and construction equipment diagnosis engineers should attend educational courses or submit an article through home study.

5.4. Comparative analysis of qualifications of Korea, the US and Japan

5.4.1. Types and functions of qualifications

The Korean qualification system for housing managers is operated according to the related laws, not by voluntary private organizations. The duties of housing managers are as comprehensive as involving both administrative and technical works. They, despite not being skilled in certain techniques, should handle technical works.

Private certifications constitute a large share of the qualification system of the United States for maintenance engineers, and there are a variety of certifications, such as those for community association management and operation (landscape, budgeting and accounting, operation of a board of directors, publication of newsletters, preparation of documents, community association control, communication of association members, etc.) and for building operation and property management (financing, employment and management of human resources, legal review, leasing, etc.) and for maintenance and repair of buildings and facilities (apartment repair, repair and control of air conditioning facilities, and electrical control and pipeline management).

The certifications of Japan for maintenance engineers cover advisory services and counseling for community associations, community association management, management of contracts for management works, designing/planning/operating of buildings, building operation and management, preparation and management of maintenance and preservation plans, building diagnosis, degeneration checks for construction finishing materials, management of related engineers, repair and degeneration checks for facilities, and so on.

5.4.2. Requirements for qualification application

The housing manager certification of Korea does not require applicants to meet any conditions on one's age, and academic or career background.

The CAI certifications consider one's experience in business, completion of courses by stages, continuing education and moral ethics rather than one's academic background. As for the IREM certifications, applicant's academic background, experience or work history, and completion of step-by-step courses are considered. Especially, the requirements for CAI certifications are mainly about step-by-step courses ($A > B > C$) and applicant's integrity (ethics, morality and continuing education), which helps certified engineers continually improve their abilities.

The national qualifications of Japan do not require certain conditions for application, but the other private ones require specific conditions for application. The High-Rise Housing Management Business Association prefers applicants having experience or other certifications in related fields, and BELCA asks applicants to meet the conditions on the attainment of other recognized qualifications, academic background and work experience.

5.4.3. Redesignation and continuing education

Except for the statutory education that is provided for housing managers of Korea within a certain period from designation, no redesignation or continuing education is required.

The certifications of the United States should be renewed every one or three years, and a certified engineer needs to obtain certain credit points from the continuing education in order to receive redesignation.

The credit points can be acquired not only from the institute's regular curriculums but also from conference attendance and participation, authorship and other activities, which contributes to establishing an environment in which certified engineers, even after designation, can have constant access to various materials, conferences, information and so on.

Japan requires all of the certified maintenance engineers to be redesignated every five years and to attend continuing education when redesignated. Those with the national certifications should receive statutory education and others with the private certifications should attend courses or submit an article or thesis.

6. Proposal of ways to develop maintenance engineers for multiple dwellings

The current trends of Korea, such as an increase in high-rise residential buildings, demands of multiple dwellings in metropolitan areas for repair and maintenance, aging society, and a variety of demands from occupants, require us to be prompt in developing maintenance engineers for multiple dwellings who are able to tackle such changes. A comparative analysis was conducted on the Korean, US and Japanese qualification systems for housing maintenance, and based on the results of the analysis, the ways to develop maintenance engineers for multiple dwellings in Korea were presented.

First, it is necessary to develop a variety of certifications so as to respond to the huge number of multi-family dwellings, increasing diversity of life and the like.

To satisfy the great demands for maintenance of multiple dwellings and for maintenance techniques, private certifications are required so that market demands are met promptly. It is possible to refer to the qualifications of the United States and Japan for housing maintenance, and then to develop detailed certifications that are divided into those qualifications for community association management and operation; for building operation and property management; and for repair and maintenance of buildings and facilities.

The types of potential certifications for Korea are proposed as follows: community association management (support for optimal operation of community association; advisory service/counseling, association control, etc.); property management for buildings (property management, financial management and building management); and diagnosis of buildings and checking of finishing materials and facilities. Since there are a number of high-rise residential buildings accommodating many families in Korea, it is necessary to give preference to developing certifications on safety checks for buildings and facilities, optimal operation of community association, and counseling. It will take an enormous amount of time to establish such certifications, therefore, it is possible to

develop the said three types of certifications by operating the professionals dispatch system which has been operated by Tokyo Machizukuri Center (Tokyo Village Development Center) [25].

In Korea, about 80% of the entire housing units are up to 20-years old. It is, thus, required to develop certifications for facilities, pipelines and finishing materials (e.g. outer walls, tiles) rather than for main structural parts. It is also necessary to establish qualifications for making a decision and providing counseling on repair and reconstruction.

These certifications can be divided up into national and private ones. Qualifications that are discovered to be critical for the maintenance of multiple dwellings through constant monitoring and demand surveys, and which are highly demanded in society need to be developed as national certifications.

Private certifications should be developed so as to improve the quality of life and meet the variety of life. And, they need to be organized to reflect characteristics of private institutes and to handle specialized fields. Constant creation of demands for maintenance and specialization are the conditions that determine the success or failure of private certifications. Those certifications that satisfy the conditions can be absorbed into national ones or used in personnel assignments according to relevant laws.

Second, the housing managers need to concentrate on general administrative works for multiple dwellings.

The engineers with the housing manager certification of Korea are responsible for both administrative and technical works. According to the Housing Act, a housing manager can autonomously implement safety checks for multiple dwellings. There have been a few housing managers who attended professional courses on architecture or construction, even though statutory education has been provided to them. It is desirable that specialized firms should handle works requiring technical skills [26]. The qualification systems of the United States and Japan clearly separate administrative areas from technical ones, hence, engineers specializing in certain fields conduct works in the corresponding fields only. Therefore, the duties of the housing managers need to be narrowed down and limited to property management for multiple dwellings and control of community living (general works, planning, operation and counseling).

Last, as a means to continually improve professional abilities of housing managers, it is necessary to develop step-by-step courses required for certification designation, and continuing education.

In the United States, designation of a certification is not a one-time event but is composed of step-by-step courses. In other words, certified engineers who have attained a qualification must maintain the current qualification to obtain a higher level one by attending step-by-step courses, which allows the engineers to be tested in educational performance and to make constant efforts for enhancing their skills. Such a system is thought to be more efficient in developing skilled and active human resources than the examination system for evaluating one's educational achievement.

Effective continuing education for developing specialists is also required. The housing managers have been provided with a one-time statutory education so far. They, however, need to attain certain credit points from continuing education even after being designated, which will contribute to establishing a system to continually develop the abilities of the managers.

7. Conclusions and further research

Korea, despite having a huge housing stock and a great number of high-rise multiple dwellings, has implemented policies for new construction rather than maintaining and rehabilitating existing multi-family dwellings. There have been a few measures for housing maintenance and green policies. Now, it has been a considerable time since the construction of condominiums in Seoul and in the first new towns in Bundang and Ilsan. At this point in time, it is urgently required to develop engineers who are capable of maintaining the existing multiple dwellings so that the existing housing can be safely used while being maintained at a decent quality level.

In this study, an analysis was made on the qualifications of the United States and Japan, and based on the results of the analysis, the ways to develop maintenance engineers for multiple dwellings in Korea were proposed as follows:

First, there was a need to develop certifications for maintenance that are able to respond to a great number of multi-family housing units and increasing diversity of life along with the types of the certifications.

Second, the roles of housing managers were narrowed down. It was suggested that the housing managers need to focus on property management for multiple dwellings and management of community living (general works, planning, managing and counseling) and that the works requiring technical skills should be entrusted to specialized firms.

Next, step-by-step courses required for certification designation and continuing education were presented so that the certified managers of Korea can continually improve their skills.

Last of all, the qualification systems of the United States and Japan for housing maintenance were examined by this study. Therefore, further research needs to be conducted on the qualification systems of the other developed nations such as European countries. In addition, if certain private certifications are recognized as essential, due to constant efforts for creating demands for maintenance, there is a need to find a legal basis in the related laws according to which those private certifications can be actually used in business.

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